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Silurian Favositids (Coelenterata: Tabulata) from the Gionyama Formation, Miyazaki Prefecture, Japan

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Abstract Five species of favositid tabulate corals are described from the Silurian Gionyama Formation in the Kuraoka area, Miyazaki Prefecture, southern Japan. They are *Favosites aokii* Sugiyama, 1940, *Favosites* sp. cf. *F. forbesi* Milne-Edwards and Haime, 1851, *Favosites* sp. cf. *F. favosiformis* Sokolov, 1951, *Thecia ichikawai* sp. nov., and *Angopora hisingeri* (Jones, 1930). Except for *F.* sp. cf. *F. forbesi* that occurs in the upper Wenlock (upper Lower Silurian) G2 and lower Ludlow (lower Upper Silurian) G3 Members, *F. aokii*, *F.* sp. cf. *F. forbesi* and *T. ichikawai* are only known from the G2 Member and the occurrence of *A. hisingeri* is restricted in the G3 Member. The most characteristic respects of *T. ichikawai* are its relatively large corallite diameters and closely to very closely spaced tabulae. The Gionyama specimens of *Angopora* represent the first record of the genus in Japan.

Key words: Wenlock to Ludlow (late Early to early Late Silurian), *Favosites, Thecia*, *Angopora*, Gionyama Formation

Introduction

This paper is a new instilment of the serial papers (Niko, 1998; Niko and Adachi, 1999a and b, 2000, 2002, 2004, 2008) on the tabulate coral fauna from the Silurian Gionyama Formation of the Kuraoka area, Miyazaki Prefecture, southern Japan. During our long termed project, important geologic knowledge of the Gionyama Formation was added by Kido and Sugiyama (2007) and Kido (2009), in which papers Hamada's (1959) subdivision of the formation into the G1 to G4 Members was abandoned and the Lower, Middle and Upper Members were newly proposed. Among them, the Lower and Upper Members can be respectively correlated with the G1 and G4 Members and the Middle Member is equivalent to the incorporated stratum of the G2 and G3 Members. Because our idea concerning the stratigraphy of the formation will publish elsewhere, we still use the previous nomenclature.

Total 106 specimens of favositid tabulate corals are examined in this paper. They are collected from three localities on the western flank of Mt. Gionyama (see Niko, 1998, for their geologic and geographic settings) and kept in National Museum of Nature and Sciences, Tokyo (prefixed NMNS).

Systematic Paleontology

Subclass Tabulata Milne-Edwards and Haime, 1850

Order Favositida Wedekind, 1937

Suborder Favositina Wedekind, 1937

Superfamily Favositoidea Dana, 1846

Family Favositidae Dana, 1846

Subfamily Favositinae Dana, 1846

Genus ***Favosites*** Lamarck, 1816

Type species: *Favosites gothlandica* Lamarck, 1816.

Favosites aokii Sugiyama, 1940

(Figs. 1-1–5; 2-3, 4, 6)

Favosites asper [sic] *aokii* Sugiyama, 1940, p. 127, 128, pl. 22, figs. 1–5; Hamada, 1983, fig. 7.
Favosites aokii Sugiyama; Hamada, 1982, p. 6, pl. 3, fig. 17.

Material examined: Thirty-five coralla, NMNS PA17356–17390.

Description: Coralla massive with low bulbous growth form, cerioid; maximum sizes of fragmentary coralla indicate 43 mm in height and 108 mm in diameter (NMNS PA17369) and 93 mm in height and 88 mm in diameter (NMNS PA17385). Corallites prismatic have 3–8 sides in transverse section and relatively uniform in diameter ranging 0.4–1.9 mm, usually 1.2–1.6 mm in adult portion; calices very shallow and perpendicularly oriented to corallum surface. Thickness of intercorallite walls is variable even in a same corallum, ranges from thin to relatively thick, 0.03–0.21 mm; structurally they are differentiated into median line and darker stereoplasmic layer; walls usually straight, but weak to strong waves frequently developed in thickened portions; mural pores commonly occur on corallite faces as mid-wall pores and less frequently occur near corallite angles; in addition, corner pores at corallite angles are rarely developed; usual diameters of pores are 0.13–0.19 mm; some pores closed by pore plates; septal spins rare to almost absent in thin and well-developed in thick portions of walls; high conical to needle-like, 0.08–0.20 mm in length; tabulae almost complete with somewhat variable profiles indicating nearly flat, concave proximally (sagging), concave proximally (uparched) or slightly wavy; spacing of tabulae is variable, ranging from sparse to close; there are 3–15 tabulae in 5 mm of corallite length.

Occurrence: Abundant in limestone pebbles to boulders of the upper Wenlock (upper Lower Silurian) G2 Member at locality 1.

Discussion: This species was described originally by Sugiyama (1940) as a subspecies of "*Favosites*" *aspera* d'Orbigny (1850, p. 49; = *Paleofavosites aspera* in up to date taxonomy as indicated by Twenhofel, 1914, Stel and Oekentorp, 1976, and Young and Elias, 1995), Hamada (1982) gave it independent species rank. We follow this subsequent determination because the most common mural pores in *Favosites aokii* situate on the corallite faces as the mid-wall pores, whereas "*F.*" *aspera* characteristically has the corner pores. The type stratum of *F. aokii* is the Wenlock to Ludlow limestone of the Kawauchi Formation in the Southern Kitakami Terrane, Northeast Japan.

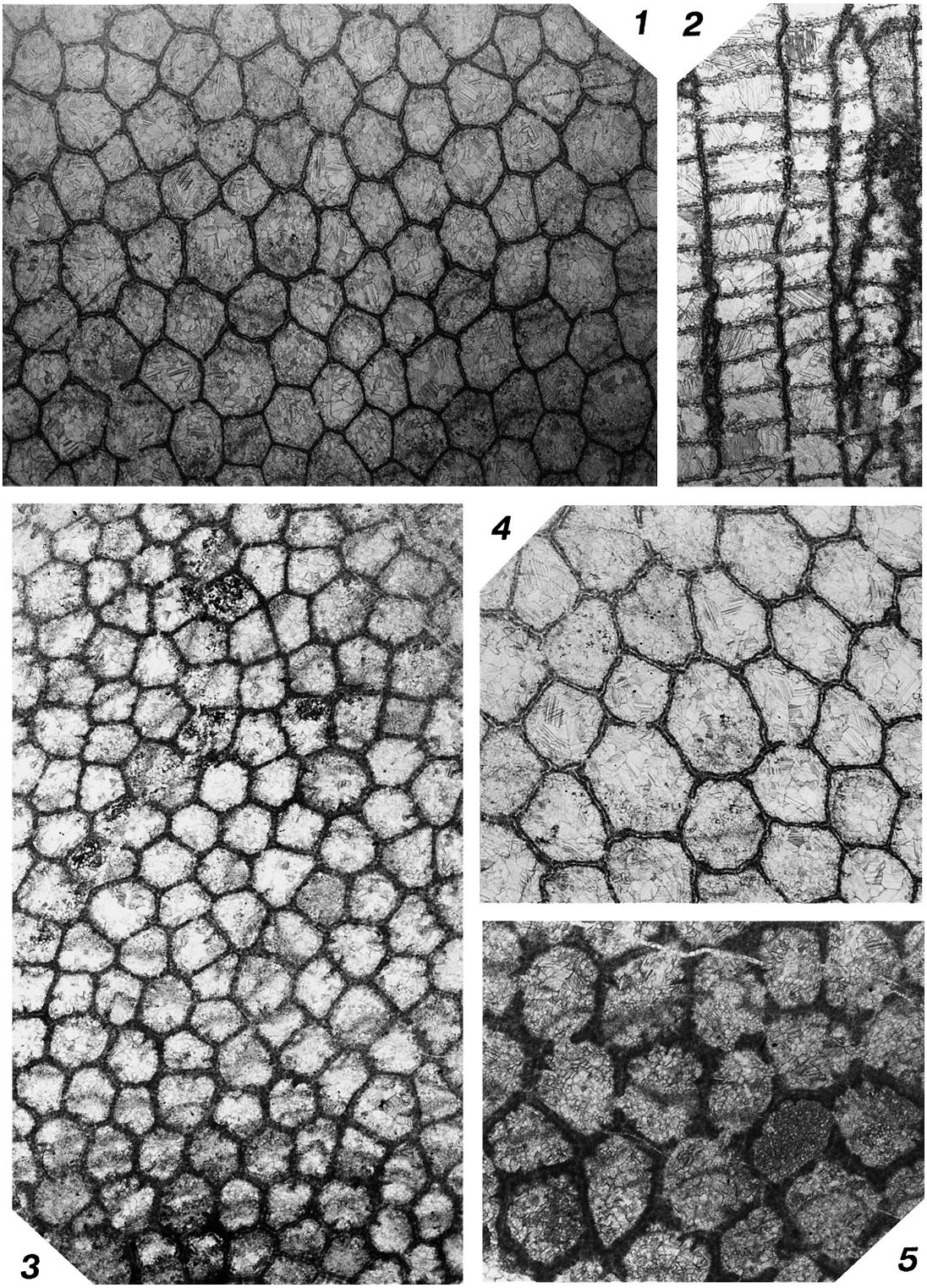
As can be seen in figures, the Gionyama specimens show some variations in intercorallite wall thickness and spacing of the tabulae. Among ranges of their morphologies, thin to weakly thickened portions of the intercorallite walls (Figs. 1-1, 3, 4) and the moderately spaced tabulae (approximately 7–11 in 5 mm; Fig. 1-2) are quite identical with the holotype.

Favosites sp. cf. ***F. forbesi***
Milne-Edwards and Haime, 1851

(Figs. 3-1–6)

Compare:
Favosites forbesi Milne-Edwards and Haime, 1851, p. 238.
See synonymy in Stel (1978), and added:
Favosites forbesi Milne-Edwards and Haime; Chernyshev, 1937a, p. 9, 10, pl. 1, figs. 3a, b, pl. 4, figs. 6a, b; Shrock and Twenhofel, 1939, p. 254; Yang, 1948, p.. 133–135, pl. 1, figs. 1a, b, 2a, b, 3a, b, 4a, b; Sokolov, 1949, p. 79, pl. 6, figs. 3, 4; Chernyshev, 1951, p. 21–23, pl. 2, figs. 1–5; Yü, 1956, p. 604, 615–617, pl. 1, figs. 1, 2; Yü, 1962, p. 51, pl. 12, figs. 1a, b, 2 a–c,

Fig. 1. *Favosites aokii* Sugiyama, 1940, thin sections. **1**, **2**, **4**, NMNS PA17365. **1**, transverse sections of corallites, ×10. **2**, longitudinal sections of corallites, ×10. **4**, partial enlargement of Fig. 1-1, showing details of mural pores and septal spines in thin walled corallites, ×14. **3**, NMNS PA17361, transverse sections of corallites, note intra-colonial variations of intercorallite walls thickness, ×10. **5**, NMNS PA17356, partial enlargement with the same specimen of Fig. 2-6, showing details of mural pores and septal spines in thick walled corallites, transverse sections, ×14.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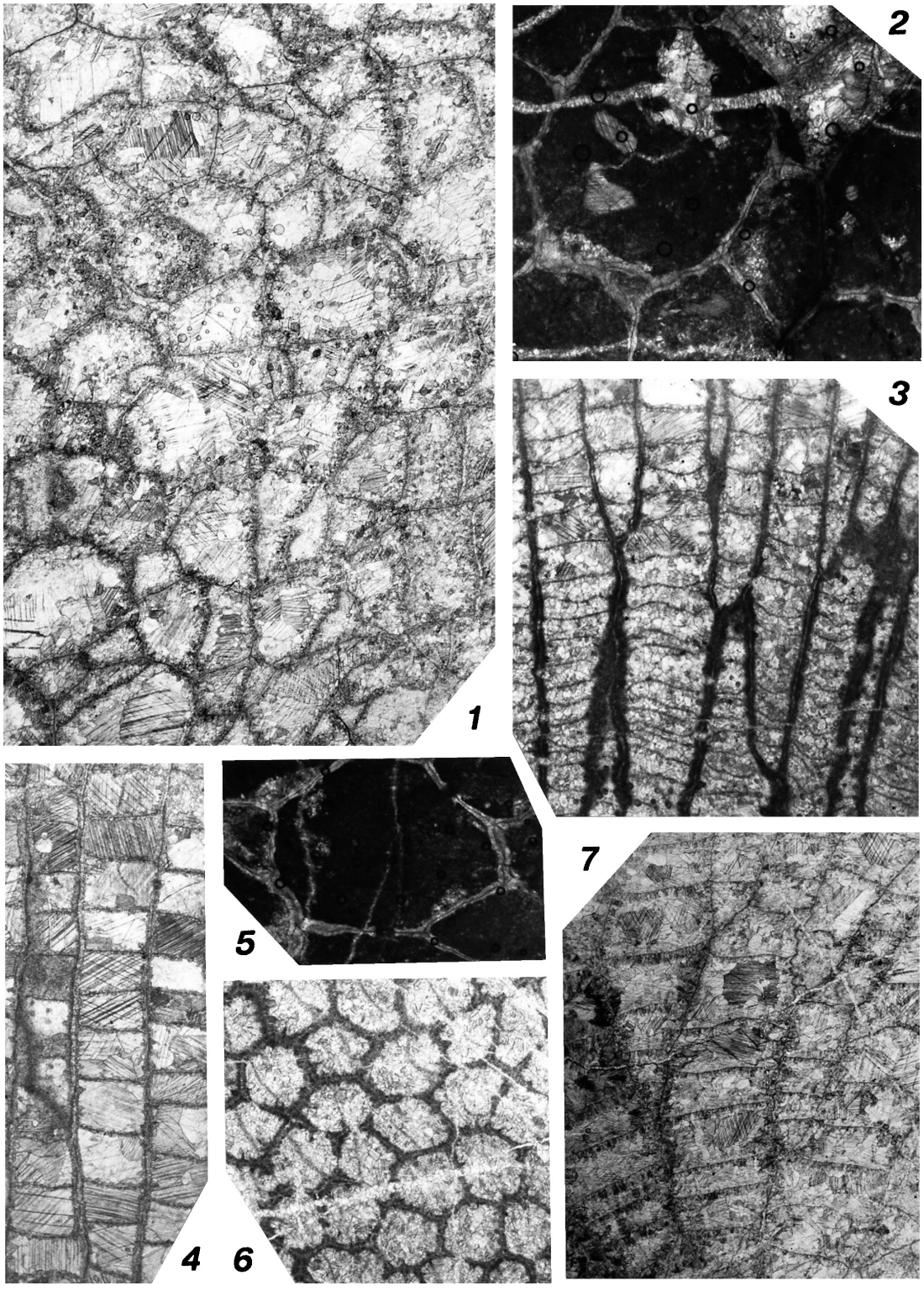
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pl. 14, figs. 1a, b, pl. 15, figs. 3 a–c; Yü *et al.*, 1963, p. 221, pl. 70, figs. 2a, b; King, 1974, p. 196, 197, pl. 38, figs. 1a, b; Lee and Noble, 1988, p. 32, 33, 36–38, figs. 3-1–21; 6-1–8.

Favosites aff. *forbesi* Milne-Edwards and Haime; Yabe and Hayasaka, 1915, p. 67, 68.

Favosites forbesi kweitungensis Grabau, 1930, p. 223–227, pl. 1, figs. 1–3, pl. 2, figs. 4, 5; Tsin, 1956, p. 627, pl. 2, figs. 3–6 [as *F. kueitingensis*]; Yü *et al.*, 1963, p. 221, 222, pl. 70, figs. 3a, b [as *F. kweitingensis*]; Yang *in* Yang *et al.*, 1978, p. 173, pl. 61, figs. 4a, b [as *F. kueitingensis*].

Favosites cf. *forbesi* Milne-Edwards and Haime; Ozaki *in* Shimizu *et al.*, 1934, p. 70, pl. 13, fig. 1.

Favosites forbesi mammilatus Chernyshev, 1936, p. 41, pl. 1, figs. 4, 5, 10.

Favosites forbesi tuvaensis Chernyshev, 1937a, p. 10, 11, pl. 1, figs. 4a, b; Keller, 1966, p. 122, 123, pl. 10, figs. 1a, b.

Favosites forbesi multiperforata Chernyshev, 1937b, p. 73, 74, text-fig. 2, pl. 2, figs. 2a, b; Barskaya and Sharkova, 1963, p. 142, 143, pl. 19, figs. 3, 4.

Favosites (*Eufavosites*) *forbesi* Milne-Edwards and Haime; Rukhin, 1937, p. 38–47, pl. 6, figs. 3–7, pl. 7, figs. 1, 2; Rukhin, 1938, p. 47, 48, pl. 8, figs. 1, 2, 7.

Favosites (*Eufavosites*) *forbesi culi* Rukhin, 1937, p. 47, 48, pl. 8, figs. 1, 2; Rukhin, 1938, p, 50, 51, pl. 9, figs. 10, 11.

Favosites (*Eufavosites*) *forbesi lenius* Rukhin, 1937, p. 48, pl. 8, figs. 3, 4.

Favosites (*Eufavosites*) *forbesi kolimaensis* Rukhin, 1938, p. 48, 49, pl. 8, figs. 4–6.

Favosites (*Eufavosites*) *forbesi mammilatus* Chernyshev; Rukhin, 1938, p. 49, pl. 9, figs. 1, 2.

Favosites (*Eufavosites*) *forbesi oblonga* Rukhin, 1938, p. 49, 50, pl. 9, figs. 5–7.

Favosites (*Eufavosites*) *forbesi kana* Rukhin, 1938, p. 50, pl. 8, figs. 8, 9, pl. 9, figs. 3, 8, pl. 12, fig. 7, pl. 13, fig. 1.

Favosites forbesi muralis Yang, 1948, p. 135, pl. 1, figs. 5a, b; Yü *et al.*, 1963, p. 222, pl. 70, figs. 5a, b.

[non] *Favosites forbesi similis* Sokolov, 1952, p. 49, 50, pl. 18, figs. 3, 4 [= *F. similis* Sokolov, see Klaamann, 1962, p. 36].

[non] *Favosites forbesi sugiyamai* Kamei, 1955, p. 49, 50, pl. 2, figs. 1 a–f, pl. 4, figs. 1, 2 [= *Squameofavosites sugiyamai* (Kamei), see Niko, 2006, p. 24].

[non] *Favosites forbesi takarensis* Kamei, 1955, p. 50–52, pl. 2, figs. 3 a–c, 4a, b, 5a, b, pl. 4, figs. 4–6 [= *Squameopora takarensis* (Kamei), see Niko, 2006, p. 21].

Favosites forbesi tankwanpei Tsin, 1956, p. 626, 627, pl. 2, figs. 2 a–c.

Favosites forbesi multiporoides Yü, 1956, p. 604, 605, 617, 618, pl. 1, figs. 3, 4; Yü *et al.*, 1963, p. 222, 223, pl. 70, figs. 4a, b.

Favosites forbesi qilianshanensis Yü, 1962, p. 51, 52, pl. 13, figs. 1a, b, pl. 14, figs. 3a, b.

Favosites forbesi dongkalaensis Yang *in* Yang *et al.*, 1978, p. 172, pl. 61, figs. 1a, b.

Favosites forbesi fenggangensis Yang *in* Yang *et al.*, 1978, p. 172, pl. 61, figs. 2a, b.

Material examined: Thirty-nine coralla, NMNS PA17312–17350.

Description: Coralla massive with somewhat variable growth forms indicating thick tabular, discoid to bulbous, cerioid; boss-like projections on upper surface of coralla are rarely developed; maximum sizes of fragmentary coralla indicate 33 mm in height and 82 mm in diameter (NMNS PA17339) and 104 mm in height and 81 mm in diameter (NMNS PA17341). Corallites prismatic have 3–8 (rarely up to indistinct 10) sides in transverse section; diameters of corallites are relatively large for the genus, usually 1.8–2.3 mm in adult portion; adult corallites surrounded by immature ones. Intercorallite walls may be weakly thickened; apparent mural pore and septal spine are not observable in examined material; tabulae mostly complete with roughly flat profiles; spacing of tabulae is variable, ranging from sparse to very close; counts of tabulae in 5 mm length of corallites are 2–19.

Occurrence: Abundant in limestone pebbles to boulders of the G2 Member at locality 1 (NMNS PA17312–17344); rare in massive limestone of the lower Ludlow (lower Upper Silurian) G3 Member at locality 2 (NMNS PA17349, 17350) and locality 3 (NMNS PA17345–17348).

Fig. 2. **1**, **2**, **5**, **7**, *Favosites* sp. cf. *F. favosiformis* Sokolov, 1951, thin sections. **1**, **7**, NMNS PA17352. **1**, transverse sections of corallites, ×5. **7**, longitudinal sections of corallites, ×5. **2**, **5**, NMNS PA17354, transverse sections of corallites, ×10. **3**, **4**, **6**, *Favosites aokii* Sugiyama, 1940, thin sections. **3**, NMNS PA17371, longitudinal sections of corallites, note intra-colonial variations of intercorallite walls thickness, ×10. **4**, NMNS PA17387, longitudinal sections of corallites, ×10. **6**, NMNS PA17356, transverse sections of thick walled portions of corallites, ×10.

Discussion: On the basis of their corallite diameters and arrangement of the mature and immature corallites, the Gionyama specimens compare favorably with *Favosites forbesi* Milne-Edwards and Haime, 1851, that widely known from the Silurian strata. Without information about the mural pores and septal spines, a reliable specific identification of the specimens is impossible.

Favosites sp. cf. ***F. favosiformis*** Sokolov, 1951

(Figs. 2-1, 2, 5, 7)

Compare:

Favosites favosiformis Sokolov, 1951, p. 86, 87, pl. 33, figs. 3, 4; Klaamann, 1964, p. 64, 65, pl. 18, figs. 3 − 6; Stasinska, 1967, p. 79, pl. 21, figs. 3a, b.

Favosites favosiformis globosa Sokolov, 1951, p. 88–90, pl. 35, figs. 1–3.

Material examined: Five coralla, NMNS PA17351–17355.

Description: Coralla massive with high bulbous to subspherical growth forms, cerioid; largest specimen of fragmentally corallum (NMNS PA17351) indicates 34 mm in height and 38 mm in diameter. Corallites prismatic, large for the genus with 2.8–4.2 mm in usual diameters of adult portion. Intercorallite walls thin having 0.08–0.17 mm; mural pores common, occur on corallite faces; diameters of pores are 0.23–0.29 mm; septal spines sporadic, short conical; tabulae complete with roughly flat profiles; spacing of tabulae moderate; there are 2–5 tabulae in 5 mm of corallite length.

Occurrence: Rare in limestone pebbles of the G2 Member at locality 1.

Discussion: The specimens here included in *Favosites* sp. cf. *F. favosiformis* Sokolov, 1951, resemble the types from the upper Llandovery (lower Lower Silurian) of Estonia (Sokolov, 1951; Klaamann, 1964). The most diagnostic features of *F. favosiformis* are the large corallite diameters ranging from 3.0 to 4.5 mm, the thin intercorallite walls ranging 0.10 to 0.15 mm, large diameters of the mural pores attaining 0.4 mm and the short septal spines. Except for their smaller diameters of the mural pores, dimensions of the present specimens nearly fall within the range of the specific concept. *Favosites favosiformis* was also recoded by Stasinska (1967) from the Wenlock of Norway and erratic boulders in Poland.

Family Theciidae Milne-Edwards and Haime, 1850

Discussion: Two different opinions have been proposed for a higher taxonomic position of the family Theciidae, namely Sokolov (1950) classified this family into the order Favositida, and on the other hand it was assigned to the order Sarcinulida by Hill (1981). We followed a Hill's idea in provisional report (Adachi and Niko, 1996). However, this family belongs herein to the Favositida based on similarities of intercorallite wall structures in the proximal corallites of the present two species, *Thecia ichikawai* sp. nov. and *Angopora hisingeri* (Jones, 1930), and the usual ones of *Favosites*.

Genus ***Thecia*** Milne-Edwards and Haime, 1849

Type species: *Porites expatiata* Lonsdale, 1839.

Thecia ichikawai sp. nov.

(Fig. 4-1–7; 5-1, 2, 4)

Thecia sp., Adachi and Niko, 1996, p. 68, figs. 2-1–3.

Holotype: NMNS PA17400, from which five thin sections were made.

Paratypes: Fifteen thin sections were studied from the eight paratypes, NMNS PA17393–17396, 17399, 17402, 17408, 17409.

Other material examined: NMNS PA17397, 17398, 17401, 17403–17407, 17410–17417.

Diagnosis: Species of *Thecia* with encrusting coralla composed of multiple layers of lamellae and relatively large corallite diameters attaining 2.0 mm; thickened intercorallite walls attain approximately 0.5 mm; septal spines long to

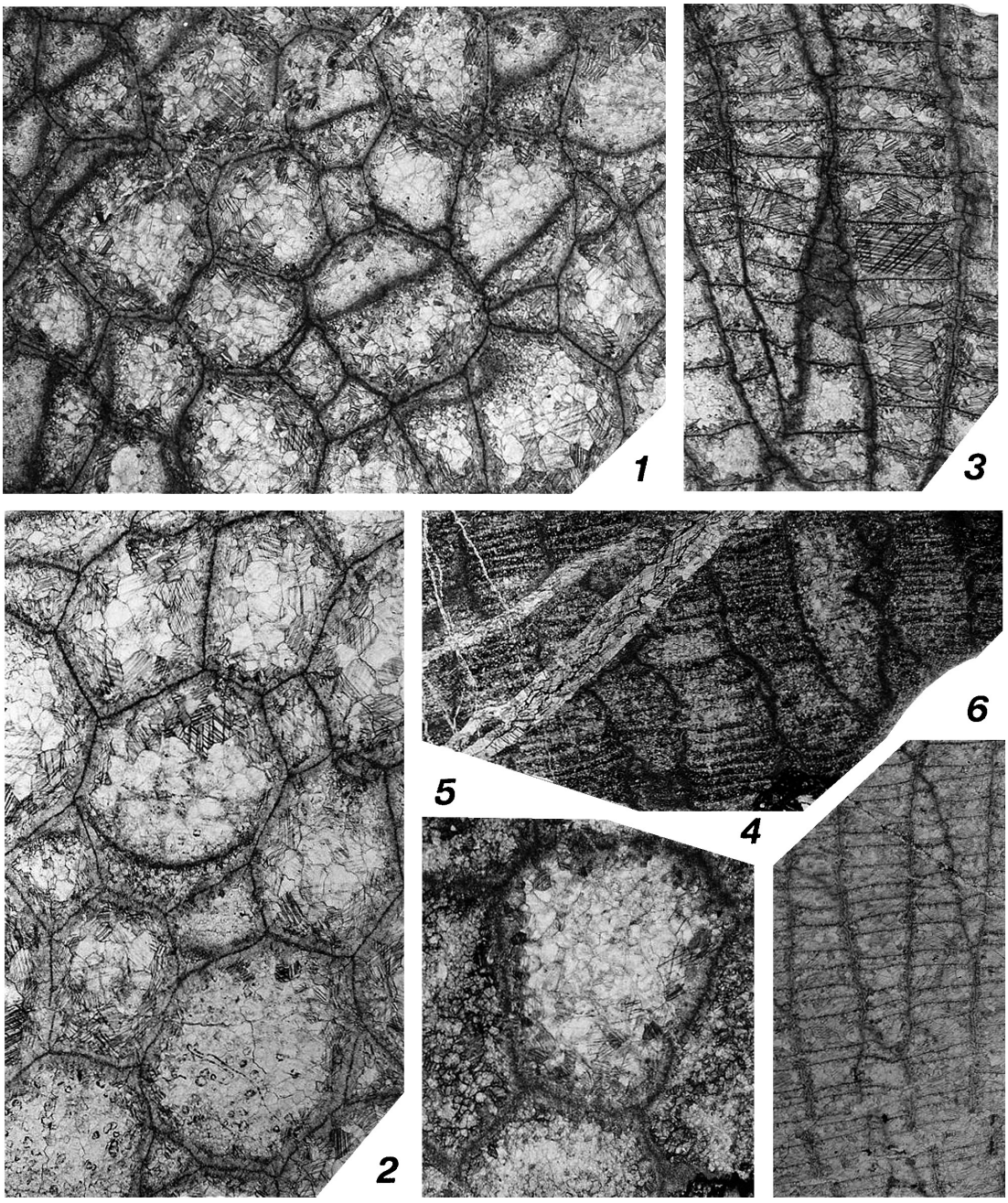
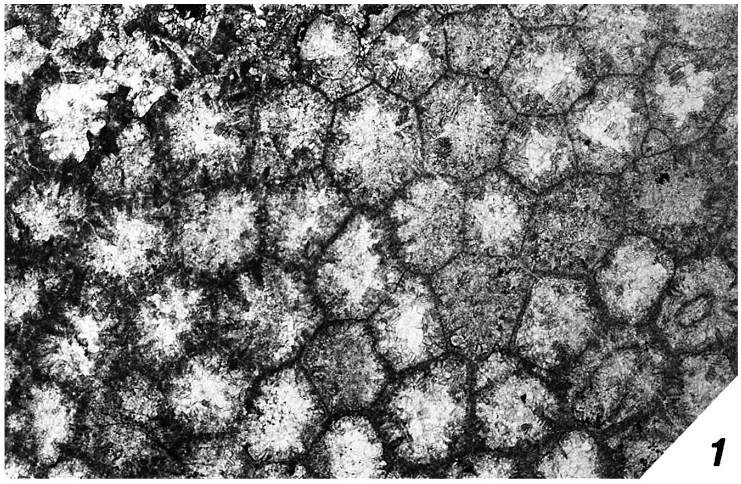


Fig. 3. *Favosites* sp. cf. *F. forbesi* Milne-Edwards and Haime, 1851, thin sections. **1**–**3**, NMNS PA17318. **1**, transverse sections of corallites, ×10. **2**, transverse sections of corallites, ×14. **3**, longitudinal sections of corallites, ×10. **4**, **5**, NMNS PA17315. **4**, longitudinal sections of corallites, ×5. **5**, transverse sections of corallites, ×14. **6**, NMNS PA17312, longitudinal sections of corallites, ×5.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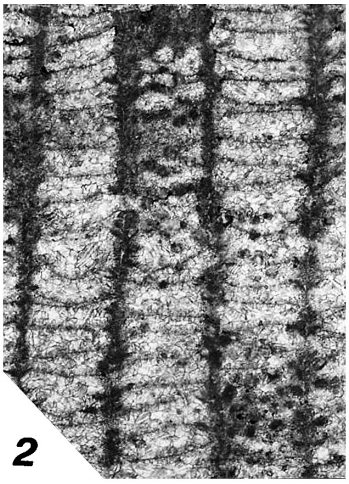
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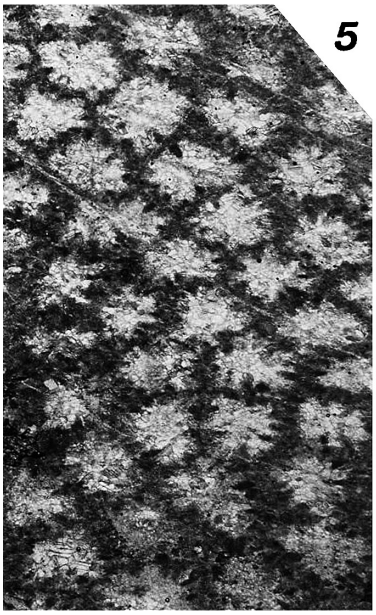
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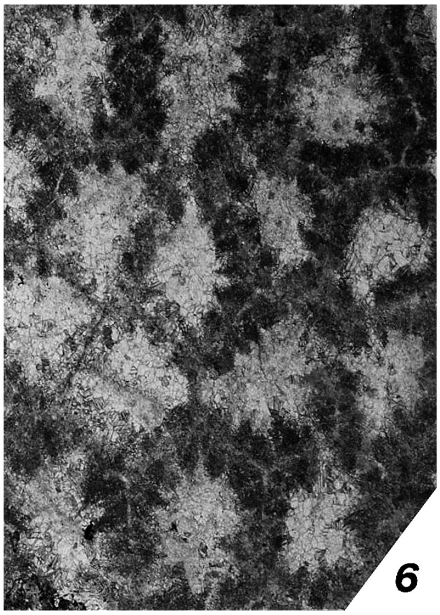
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exceptionally long with 0.14–0.59 mm; tabulae indicate close to very close in spacing; 11–21 tabulae in 5 mm.

Description: Coralla encrusting, tabular in total growth form and composed of multiple layers of relatively thick lamellae; each lamella has approximately 3–20 mm in thickness, mostly cerioid; largest fragment of corallum consisting two lamellae with intra-lamella lacuna (paratype, NMNS PA17396) attains 43 mm in height and 80 mm in diameter. Corallites sub-prismatic in proximal and prismatic in distal portions; in basal part of lamellae, proximal corallites prostrate and alveolitoid-like, then they indicate upward bent to form erect distal portions; transverse sections of corallites are sub-trapezoidal to fan-shaped in proximal and polygonal with 5–7 sides in distal portions of corallites; diameters of corallites are relatively large for the genus and almost uniform in each lamella, range from 1.0 to 2.0 mm; calices nearly perpendicular to surface of lamella; no apparent increase of new corallite is observable. Intercorallite walls always thin in proximal corallites at basal part of lamellae; in addition, thin walled portions rarely occur in distal ones near periphery; structurally thin walls differentiated into median dark line and stereoplasm; usual walls thickened by microgranular (?) stereoplasma and septal spines; partial confluence of septal spines exhibits astreoid- to thamnasterioid-like appearances; thus thickness of intercorallite walls variable, 0.08–0.13 mm in thin walled portions and thickened attaining approximately 0.5 mm in thamnasterioid-like portions; mural pores well-developed, have circular profiles, commonly occur on corallite faces and rarely at corallite angles; diameters of typical mural pores are 0.29–0.44 mm; septal spines needle-like to high conical, long to exceptionally long, and variable in occurrence, range almost absent to numerous; length of protrude portions of septal spines are 0.14–0.59 mm; tabulae complete with horizontal to weakly concave proximally or incomplete in relatively rare cases; spacing of tabulae close to very close; there are 11–21 tabulae in 5 mm of corallite length.

Etymology: The specific name honors Dr. Koichiro Ichikawa, in recognition of his geological contributions of the Kurosegawa Terrane including the Palaeozoic strata of the Kuraoka area.

Occurrence: Abundant in limestone pebbles to boulders of the G2 Member at locality 1.

Discussion: *Thecia ichikawai* sp. nov. is most similar to *T. expatiata* (Lonsdale, 1839, p. 687, pl. 15, figs. 3, 3a; Oekentorp, 1970, p. 148, 149, 151, pl. 12, figs. 1, 2; Hill, 1981, figs. 351-2a–c) from the Wenlock strata in Great Britain, but the species differs by having larger corallite diameters and more closely spaced tabulae. Corallite diameters of the new species attain 2.0 mm, whereas those of *T. expatiata* range from 0.8 to 1.1 mm.

Genus ***Angopora*** Jones, 1936

Type species: *Laminopora hisingeri* Jones, 1930.

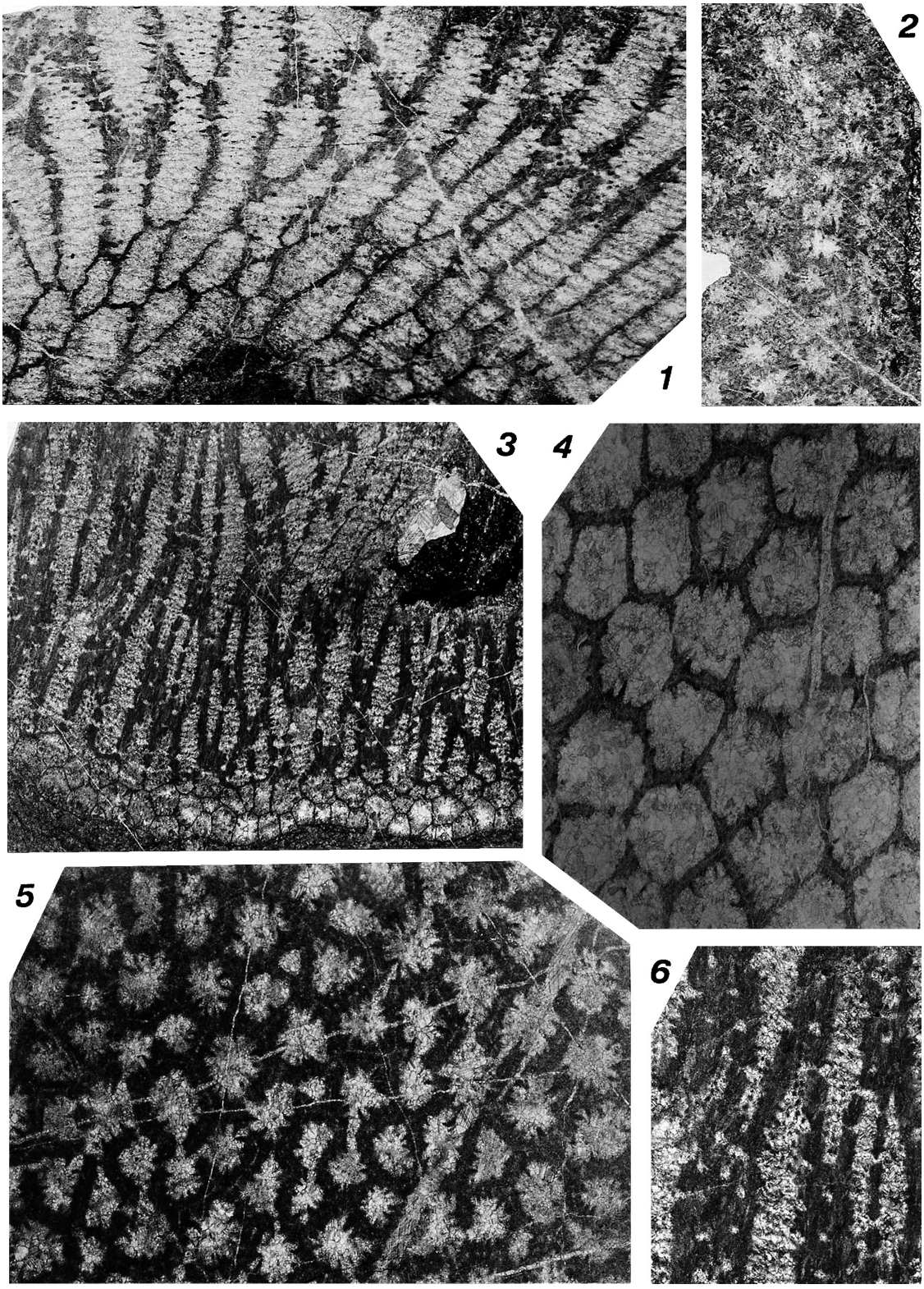
Angopora hisingeri (Jones, 1930)

(Figs. 5-3, 5, 6)

Laminopora hisingeri Jones, 1930, p. 35.

Angopora hisingeri (Jones); Jones, 1936, p. 18, 19, pl. 2, figs. 4–7, pl. 3, figs. 1, 2; Sokolov, 1955, pl. 2, fig. 4, pl. 27, figs. 3–6; Stasinska, 1967, p. 61, 62, pl. 10, figs. 1–3; Klaamann, 1970, p. 62–64, 65, 66, text-figs. 2-A–C, pl. 1, figs. 1–3, pl. 2, figs. 1－4, pl. 3, figs. 1, 2, pl.

Fig. 4. *Thecia ichikawai* sp. nov. thin sections. **1**, **2**, paratype, NMS PA17393. **1**, transverse sections of corallites, note intra-colonial variations of intercorallite walls thickness and distribution of septal spines, ×10. **2**, longitudinal sections of corallites, ×10. **3**–**5**, holotype, NMNS PA17400. **3**, longitudinal section of corallum, ×5. **4**, partial enlargement of Fig. 4-3, showing details of intercorallite wall structure and septal spines, ×10. **5**, transverse sections of thick walled corallites, ×10. **6**, paratype, NMNS PA17394, transverse sections of thick walled corallites, showing details of intercorallite wall structure and septal spines, ×14. **7**, paratype, NMNS PA17399, transverse sections of corallites, showing details of intercorallite wall structure and septal spines, ×14.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4, figs. 1–4; Wang, 1981, p. 40, pl. 24, figs. 4a, b; Scrutton, 1997, text-figs. 13-A–D.

Thecia hisingeri (Jones); Hill and Stumm, 1956, text-figs. 351-1c, d.

Thecia (*Angopora*) *hisingeri* (Jones); Hill, 1981, text-figs. 351-1a, b.

Material examined: Two coralla, NMNS PA17391, 17392.

Description: Coralla tabular, mostly cerioid; largest fragment of corallum (NMNS PA17392) attains 19 mm in height and 64 mm in diameter. Proximal corallites in basal part of corallum are prostrate and alveolitoid-like; transverse sections of proximal corallites are sub-trapezoidal to fan-shaped; more distal corallites erect, sub-polygonal having indistinctly 4–8 sided transverse sections; corallite diameters 0.7–1.5 mm; calices normal to corallum surface; increases of new corallites are probably lateral. Intercorallite walls thin in proximal corallites, where they are structurally differentiated into median dark line and stereoplasm; walls of distal corallites are thickened by microgranular (?) stereoplasma and septal spines; thickness of intercorallite walls ranges from 0.10 to 0.38 mm; mural pores abundantly occur on corallite faces and at corallite angles; diameters of typical pores having circular profiles are 0.13–0.21 mm; septal spines absent in proximal portions of corallites, but needle-like spines numerously occur in distal ones; length of protrude portions of septal spines are long, 0.12–0.29 mm; complete tabulae most common, but incomplete ones frequently developed; spacing of tabulae very close; there are approximately 7–13 tabulae in 2 mm of corallite length.

Occurrence: Rare in massive limestone of the G3 Member at locality 2.

Discussion: The general corallite morphologies, intercorallite walls, septal spines and tabulae of the Gionyama specimens are consistent with those of the types from the Wenlock of Gotland. *Angopora hisingeri* is also recoded from Great Britain (Jones, 1936), Norway, Estonia and Poland (Stasinska, 1967), Xinjiang in Northeast China (Wang, 1981), and Ireland (Scrutton, 1997). The present discovery from the Kuraoka area represents the first record of *Angopora* from Japan.

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Fig. 5. **1**, **2**, **4**, *Thecia ichikawai* sp. nov. thin sections. **1**, **4**, NMNS PA17395, paratype. **1**, longitudinal section of corallum, ×5. **4**, transverse sections of thin walled corallites, ×10. **2**, NMNS PA17402, paratype, transverse sections of thick walled corallites, ×5. **3**, **5**, **6**, *Angopora hisingeri* (Jones, 1930), thin sections. **3**, **6**, NMNS PA17392. **3**, longitudinal sections of corallum, ×5. **6**, partial enlargement of Fig. 5-3, showing details of intercorallite walls, ×10. **5**, NMNS PA17391, transverse sections of corallites, ×10.

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